

CHEMICAL ENGINEERING

PNRR/PoC NanoZoom - Functional Hybrid Nanoparticles for the Advanced Chemical Reprogramming and Visualization of Cancer Cells

Funded By	EUROPEAN COMMISSION HUB NODES: NORD OVEST DIGITALE E SOSTENIBILE SOCIETA' CONSORTILE A RESPONSABILITA' LIMITATA [P.iva/CF:12714360018]
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Contact	
Context of the research activity	<p>The research program of this PhD is related to the project PoC NODES NanoZoom, entitled "Nanoparticelle come innovativi agenti di contrasto ad alta risoluzione e profondità per l'imaging tumorale (for the 1st year) and the project RESYNC (for the next 2 years) entitled "Functional chemical reprogramming of cancer cells to induce antitumor immunity" and funded by EU within the program EIC Pathfinder of the European Innovation Council.</p> <p>Cancer is nowadays one of the leading causes of death worldwide. Early diagnosis is still one of the best strategies to improve the efficacy of clinical treatments. Recent developments at the frontier of research have focused their attention on the design of innovative contrast agents, endowed with high biocompatibility, sensitivity and specificity. The goal is to assess the presence of a pathology, especially cancer, with speed and precision, to provide targeted and timely treatments.</p> <p>The NanoZoom project aim to adopt a system with a double imaging method: the sonoluminescence and the echography, improved in precision, depth of penetration and specificity thanks to the presence of innovative hybrid nanoparticles, called Lipo-NPs.</p> <p>The RESYNC project involves a consortium of six international partners in Europe, including a private company and 5 universities and research institutions (Lund University, Karolinska Institutet, Babes-Bolyaj University and IOBC in Prague) to develop an innovative anti-tumor cellular immunotherapy. The research program will be based on the screening of small molecules capable of acting as transcription factors and their transport via multifunctional and innovative nanoparticles (i.e. the Lipo NPs) to reprogram the functioning of tumor cells into immunogenic type 1 dendritic cells and elicit an anti-tumor immune response.</p> <p>The high scientific and technological content of both research programs will allow to consolidate and expand solid skills in the field of nanotechnologies applied to biology and medicine in the field of cancer diagnosis and treatment.</p> <p>Progetto finanziato nell'ambito del PNRR - PNRR – M4C2 – AVVISO</p>

Objectives

The applicant is requested to take part in the project and perform the the research activities in collaboration with the partners of the project consortium and in the host institution of the Department of Applied Science and Technology at Politecnico di Torino.

The planned research activities are related to the study, formulation and chemical-physical study of nanomaterials to obtain innovative nanoparticles (Lipo-NPs), with selectivity towards target organs, ability to work as nanocontrast agents and able to release molecules for the reprogramming of tumor cells and the induction of immune response.

In particular the research will develop lipid nanoparticles and hybrid nanoparticles (Lipo-NPs) made by metal oxide core and lipid bilayer shell to produce efficient nanocontrast imaging agents and effective drug delivery system. The imaging set up and chemical compounds used to reprogram cancer cells will be explored and developed within the project course. The biological activity will be carried out in vitro and further in vivo on tumor models recapitulating the distinguished features of pancreatic, colorectal and liver cancers.

Skills and competencies for the development of the activity

Master Degree in Biomedical Engineer is highly appreciated together with experience in nanotechnology, bionanotechnology and nanomedicine.

Technical skills: synthesis and preparation of nanoparticles, in vitro cell culture models, drug delivery, isolation and characterization of extracellular vesicles, characterization tools like Dynamic Light Scattering, Z-Potential, Nanoparticle Tracking Analysis, optical fluorescence microscopy, flow cytometry, Western Blot, immunofluorescence.

Ability to work in team, good communication skills.